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(54) Water bath wetting device.

(57) A method and apparatus for wetting char and slag in a water bath below a coal gasification reactor operated under various conditions, such as different coal types. The said apparatus, which employs a conduit supplied with water and a wetting agent, is provided with replaceable threaded nozzles for wetting the slag to facilitate removal of various slags having particular wetting characteristics.

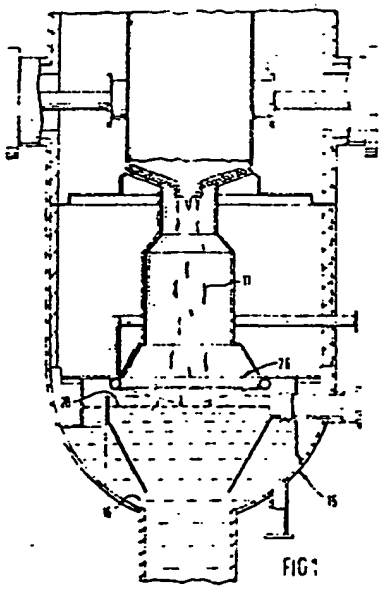

FIG 1

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WATER BATH WETTING DEVICE

The present invention relates to a method and apparatus for wetting char and slag in a water bath.

More in particular, the invention relates to such a method and apparatus in a water bath below a coal gasification reactor.

Conventional systems for quenching molten slag from a coal gasification reactor typically employ an annular duct perforated with holes for injecting oil therefrom in a random manner to wet slag in a water bath below and sink the slag for example such as those disclosed in U.S. patent specifications Nos. 4,425,254 and 4,323,366. The perforated ducts used in these systems have a fixed number of holes each with a fixed diameter and fixed angle of injection for a selected type of coal having specific wetting characteristics.

Various operating conditions such as the type of coal being gasified can change the wetting characteristics of the unconverted carbon particles of slag and char. Conventional systems may require the replacement of the entire annular duct apparatus for another configuration.

However, providing a quenching system which is easily adjustable for the different wetting characteristics of different coal types producing characteristic amounts of char and slag would allow more flexibility to operate the coal gasification process under a wider range of operating conditions.

It is therefore an object of the present invention to provide a method and apparatus for wetting char and slag in a water bath, which overcome the above problems.

The present invention therefore provides a method for wetting char and slag in a water bath, said method characterized by the steps of

(a) selecting a nozzle configuration to achieve adequate wetting of said slag;

(b) installing said nozzle configuration selected in step (a);

(c) injecting at least one fluid to wet said char and slag;

(d) wetting said char and slag in said water bath:

(e) sinking said char and slag downwardly through said water bath; and

(f) removing said char and slag from said water bath.

The invention also provides an apparatus for wetting char and slag in a water bath, characterized by:

means for selecting a nozzle configuration to achieve adequate wetting of said char and slag;

means for installing the selected nozzle configuration;

means for injecting at least one fluid through a circular conduit having at least one row of replaceable nozzles for wetting said char and slag;

means for wetting said char and slag in said water bath;

means for sinking said char and slag downwardly through said water bath, and

means for removing said char and slag from said water bath.

As already indicated in the above, the present invention relates in particular to a method and apparatus for wetting char and slag in a water bath below a coal gasification reactor, hereinafter referred to as a gasifier, wherein synthesis gas is generated.

Generation of synthesis gas occurs by partially combusting organic or carbonaceous fuel, such as coal, at relatively high temperatures in the range of 800 to 2000 °C and at a pressure range of from about 1 to 200 bar in the presence of oxygen or oxygen-containing gases in a gasifier. Steam, carbon monoxide, carbon dioxide and oxygen-containing gases including air, oxygen-enriched air, and oxygen are optionally diluted with nitrogen and/or other inert gases.

The combustion may be complete or partial, the object of the combustion process being the production of synthesis gas for power generations.

In the present invention, the ash which is the inorganic, incombustible material is separated from the fuel during the combustion of the mineral fuel. Depending on the operating conditions under which combustion takes place, in particular the temperature and the quality of the fuel, the ash is mainly obtained in solid (hereinafter referred to as char) or liquid (hereinafter referred to as slag) condition or in a combination thereof. The char and slag exit the gasifier through a discharge opening, often referred to as a slag tap, and are generally collected in a water bath located below the slag tap of the reactor. In the water bath both char and slag are cooled, the slag is solidified, and char and slag are subsequently discharged.

It is recognized by those skilled in the art that varying operating conditions, such as the temperature, quality, and type of fuel, can cause changes in the char and slag wetting characteristics and quantity. As a result, the conditions for removal the char and slag change.

The present invention relates to wetting the char and slag in the water bath to facilitate separating the char and slag from water. A circular conduit containing water and possibly as wetting agent is provided with threaded ports for changing the noz-

zle configuration depending on the wetting characteristics of the char and slag.

An advantage of the present invention is the capability of adjusting the wetting of the char and slag in the water bath according to ascertained wetting characteristics of the char and slag.

Although the invention is described hereinafter primarily with reference to particulate coal, the method and apparatus according to the invention are are also suitable for other catalytic or finely divided particulate reactive solids such as those which can be combusted as, for example, lignite, anthracite, bituminous brown coal, soot, petroleum coke and the like. Advantageously, the size of the solid carbonaceous fuel is such that about 90 percent by weight of the fuel has a particle size smaller than No. 6 mesh (A.S.T.M.).

The invention will now be described by way of example in more detail by reference to the accompanying drawings, in which:

Fig. 1 illustrates a sectional view of an apparatus of the invention;

Fig. 2 illustrates an angle of impingement of a nozzle configuration, applied in the apparatus of fig. 1;

Fig. 3 is a cross-section of the nozzle configuration of fig. 2;

Fig. 4 is a cross-section of an alternate nozzle configuration: and

Fig. 5 is a plan view of an advantageous embodiment of a nozzle configuration.

The drawings are of the process flow type in which auxiliary equipment, such as pumps, compressors, cleaning devices, etc. are not show.

Referring to Fig. 1 an apparatus, such as a conduit 26, for wetting char and slag 11 in a water bath 15 generally includes a nozzle configuration (shown in detail in Fig. 2) to achieve adequate wetting of the char and slag 11. For reason of clarity no specific details of the gasifier have been shown. Factors considered in selecting the configuration include the diameter of the nozzle 12, the force of the water, including possibly a wetting agent injected through the conduit 26 to impinge on the char and slag 11 in the water bath 15, the angle of impingement 14, and the direction of the nozzle 12 with respect to the location of the discharge opening 16 (Fig. 1) of the water bath 15.

Referring to Fig. 3, the diameter of the nozzle 12 should be about 0.6-1.3 cm to yield a velocity of about 3 m per second which will force the char and slag particles to sink while preventing the nozzle 12 from plugging with solids contained in the water recycled to the conduit 26.

The angle of impingement 14 (Fig. 2) of the water and wetting agent from the nozzle 12 with respect to the surface 28 (Fig. 1) of the water bath 15 is advantageously about 30 degrees.

The nozzles 12 are directed inwardly (Fig. 1) towards the discharge opening 16 (Fig. 1) of the water bath 15 to facilitate separation and removal of the char and slag.

It is recognized that various combinations of the above configurations could be used such as nozzles of different diameters and forces, angles of impingement, etc.

The selected configuration is installed, advantageously by screwing each selected nozzle 12 into a threaded orifice 17 as shown in Fig. 3. The threaded orifice 17 provides the capability of replacing the nozzle 12 with another nozzle 18 having a smaller diameter and greater angle of impingement with respect to the horizontal as shown in Fig. 4 to yield a greater force for sinking the char and slag to the bottom of the water bath 15.

At least one fluid, advantageously water, which is recirculated from the water bath 15 and a wetting agent are supplied to the conduit 26 as shown in Fig. 5.

Jets of water are formed in a single row (Fig. 2) with nozzles directed inwardly at an angle of about 30 degrees from the horizontal. The char and slag particles 11 (Fig. 1) which have fallen into the water bath 15 are agitated to set the particles in motion one against the other. To facilitate coagulation, a coagulant can be added to the water supplied to the conduit 26. The char and slag particles agglomerate and sink to the bottom of the water bath 15 and are subsequently removed.

Various modifications of the present invention will become apparent to those skilled in the art from the foregoing description. Such modifications are intended to fall within the scope of the appended claims.

Claims

1. A method for wetting char and slag in a water bath, said method characterized by the steps of

(a) selecting a nozzle configuration to achieve adequate wetting of said slag;

(b) installing said nozzle configuration selected in step (a);

(c) injecting at least one fluid to wet said char and slag;

(d) wetting said char and slag in said water bath;

(e) sinking said char and slag downwardly through said water bath; and

(f) removing said char and slag from said water bath.

2. The method as claimed in claim 1 characterized by repeating steps (a) and (b) with nozzles having a different configuration.

3. The method as claimed in claim 1 or 2 characterized in that the step of selecting a nozzle configuration includes selecting a nozzle diameter and angle of impingement of said at least one fluid on said char and slag.

4. The method as claimed in any one of claims 1-3 characterized in that the step of injecting at least one fluid includes injecting water and a wetting agent.

5. The method as claimed in any one of claims 1-3 characterized in that the step of injecting at least one fluid includes injecting water and a coagulating agent.

6. The method as claimed in any one of claims 1-5 characterized by the step of replacing said nozzles with nozzles having a different diameter than the replaced nozzles.

7. The method as claimed in any one of claims 1-6 characterized in that the step of installing a nozzle configuration includes directing the nozzles inwardly at an angle of about 30 degrees from the horizontal.

8. The method as claimed in any one of claims 1-7 characterized by the step of
injecting water and a wetting agent through a circular conduit having at least one row of replaceable nozzles to wet said char and slag.

9. An apparatus for wetting char and slag in a water bath, characterized by:
means for selecting a nozzle configuration to achieve adequate wetting of said char and slag;
means for installing the selected nozzle configuration;
means for injecting at least one fluid through a circular conduit having at least one row of replaceable nozzles for wetting said char and slag;
means for wetting said char and slag in said water bath:
means for sinking said char and slag downwardly through said water bath, and
means for removing said char and slag from said water bath.

10. The apparatus as claimed in claim 9 characterized by means for replacing the selected nozzle configuration with a different configuration.

11. The apparatus as claimed in claim 9 or 10 characterized in that the means for selecting a nozzle configuration includes means for selecting a nozzle diameter and angle of impingement of said at least one fluid on said slag.

12. The apparatus as claimed in claims 9-11 characterized in that the said fluid is water and a wetting agent.

13. The apparatus as claimed in any one of claims 9-12 characterized in that the said fluid is water and a coagulating agent.

14. The apparatus as claimed in any one of claims 9-13 characterized in that the means for replacing said nozzles with nozzles having a different diameter than the replaced nozzles.

15. The apparatus any one of claims 9-14 characterized in that the said nozzles are directed inwardly at an angle of about 30 degrees from the horizontal.

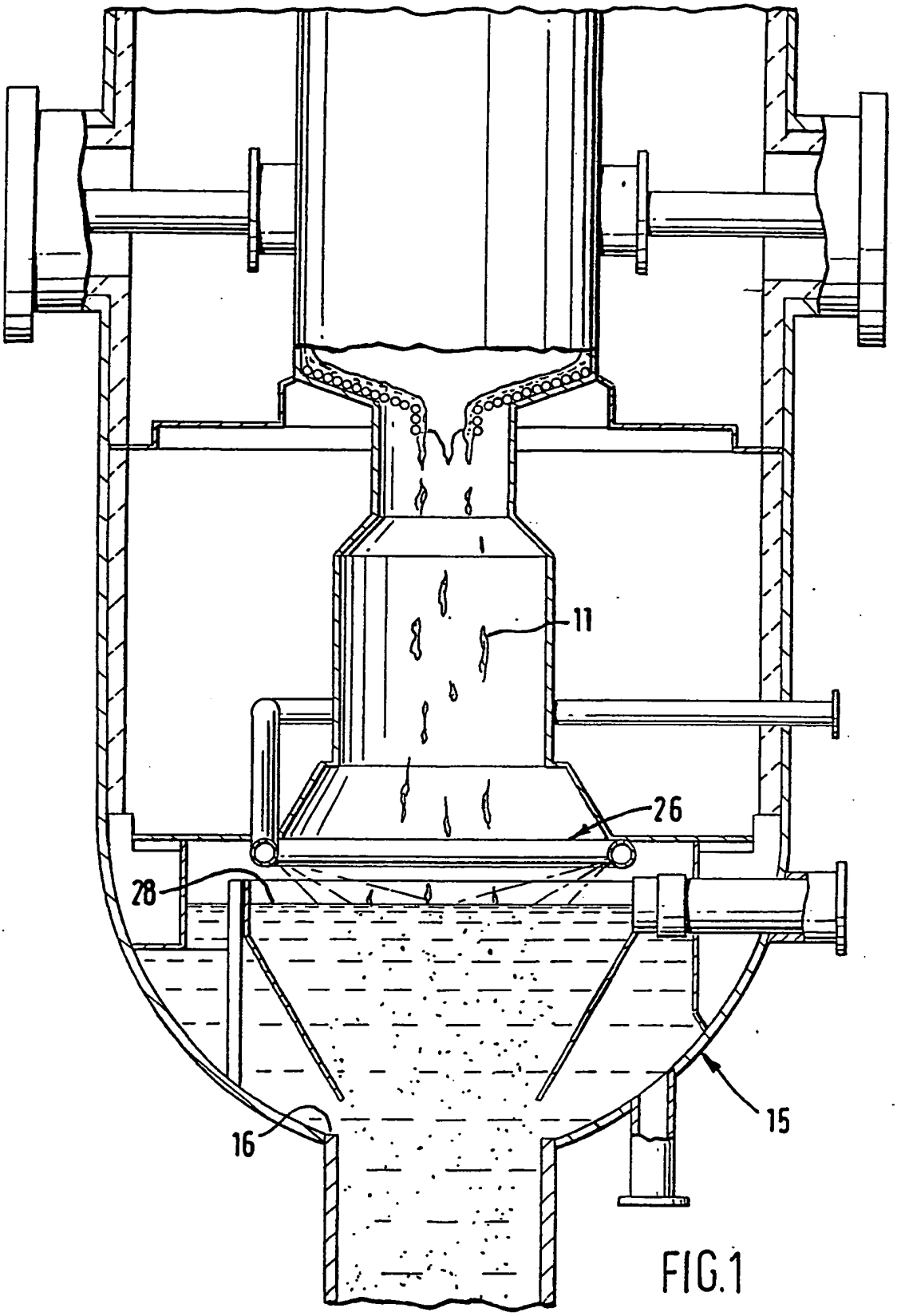

FIG.1

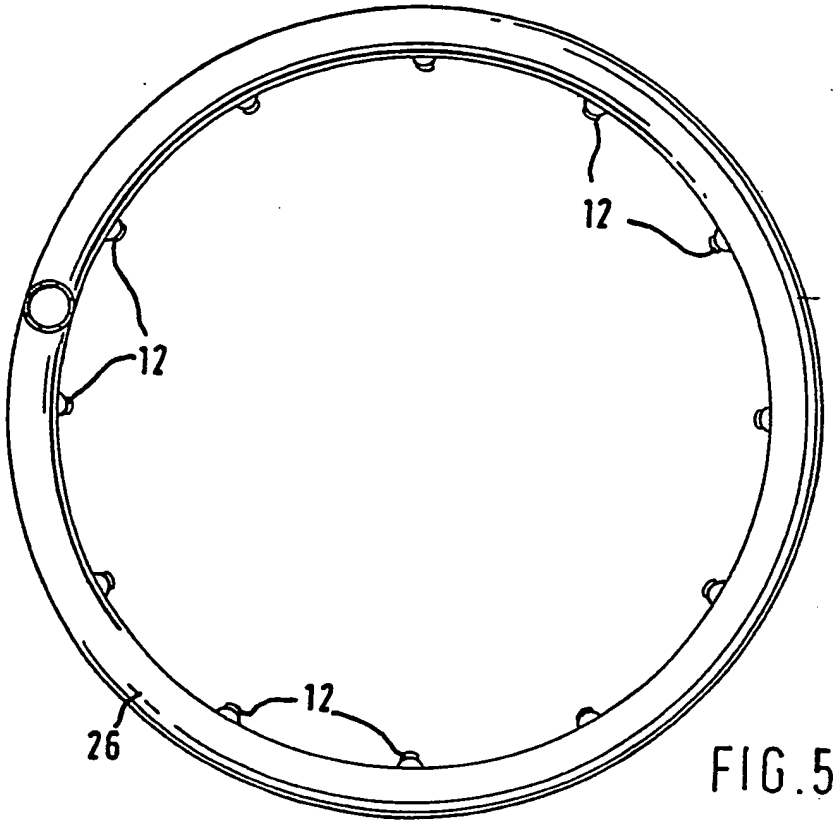

FIG.5

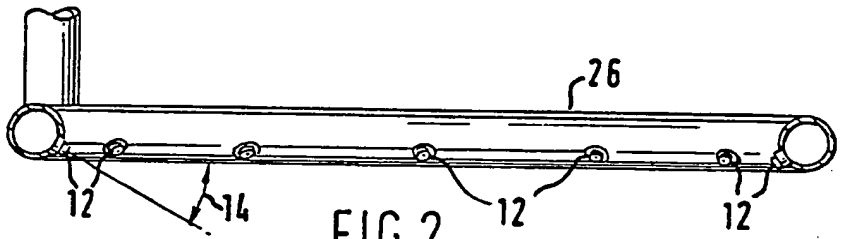

FIG.2

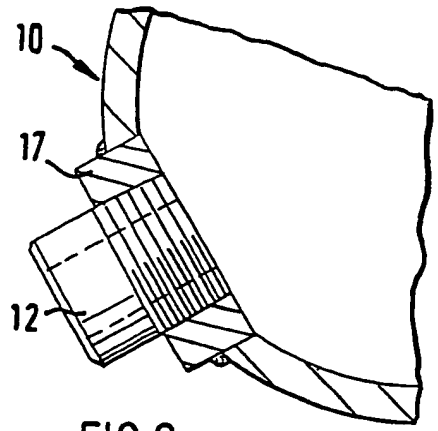

FIG.3

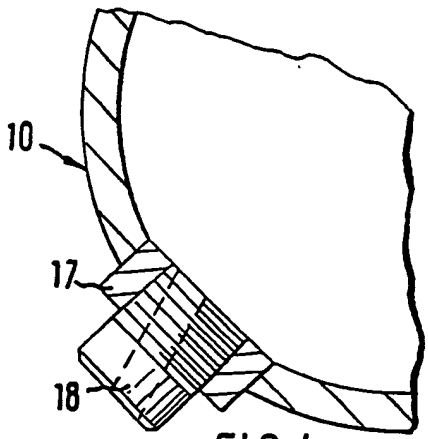

FIG.4

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EUROPEAN SEARCH REPORT

Application Number

EP 88 20 2343

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	EP-A-0 077 852 (SULZER) * Page 8, line 15 - page 9, line 24 *	1,9	C 10 J 3/52 C 10 J 3/48
A	GB-A-2 014 284 (BRITISH GAS CORP.) * Page 1, line 128 - page 2, line 66 *	1,9	—

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

C 10 J

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	20-02-1989	WENDLING J.P.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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